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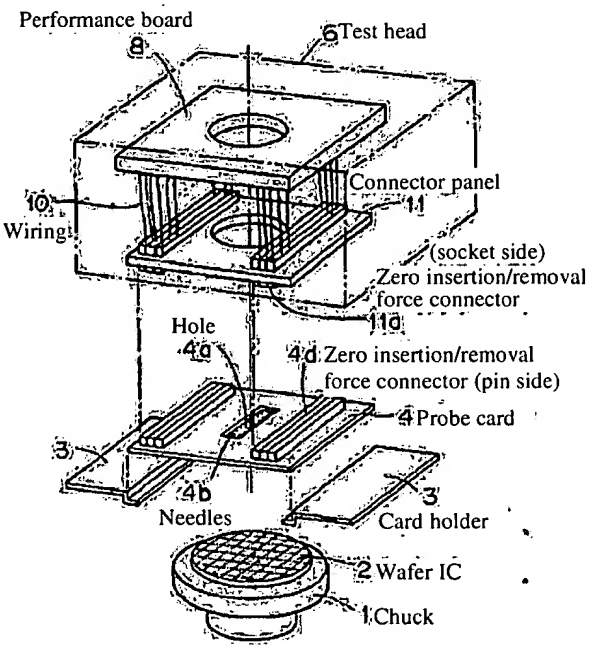
(54) (TITLE OF THE UTILITY MODEL) Test head for IC test equipment and connection mechanism to specimen

(57) (ABSTRACT)

(PURPOSE) Prevent deformation of the probe guard and improve reliability of the connection by reducing the strength that needs to be applied to the probe guard in order to form an electrical connection.

(CONSTITUTION) Probe card 4 is furnished with multiple needles 4b for making an electrical connection with the sample on the base of the circuit board, on top of which are mounted a zero insertion/removal force connectors 4d furnished with a contact that is electrically connected to each of these needles. Probe card 4 is supported by card holder 3. Connector panel 11 is attached to test head 6 across from probe card 4. Said panel 11 is furnished with zero insertion/removal force connectors 11a, which are connected to zero insertion/removal force connectors 4d.

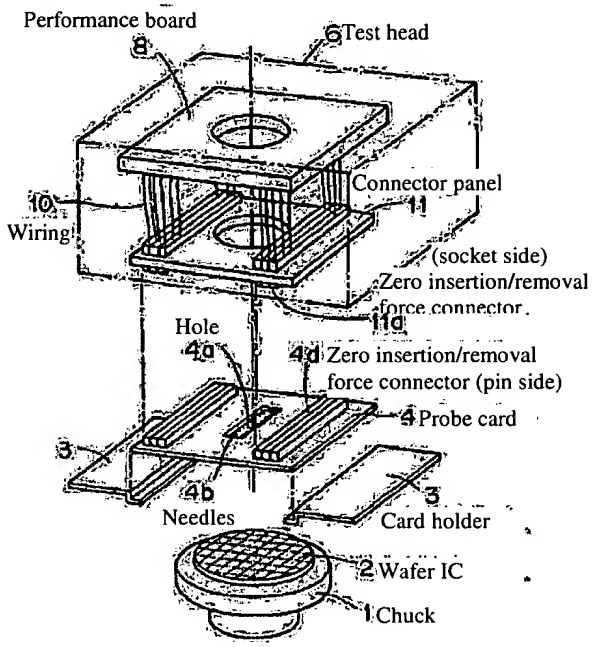
Figure 1



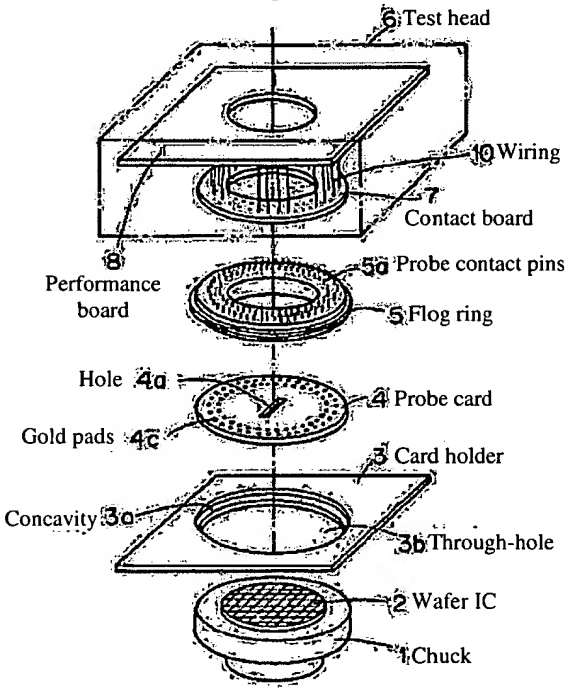
(SCOPE OF PATENT CLAIMS)
(CLAIM 1) Test head for IC test equipment and mechanism for connecting to specimen comprising a probe card equipped with several needles for making an electrical connection with the sample on the base of the circuit board, on top of which are mounted a zero insertion/removal force connectors furnished with a contact that is electrically connected to each of these needles, and a connector panel that is attached to the test head across from the aforesaid probe card and is equipped with a zero insertion/removal force connectors that are connected to the aforesaid zero insertion/removal force connectors on said probe card.

(BRIEF DESCRIPTION OF THE DRAWINGS)
(FIGURE 1) Partially cut away cross-section of an embodiment of this utility model.
(FIGURE 2) Partially cut away cross-section of a prior art connection mechanism.
(FIGURE 3) Longitudinal section of Figure 2.

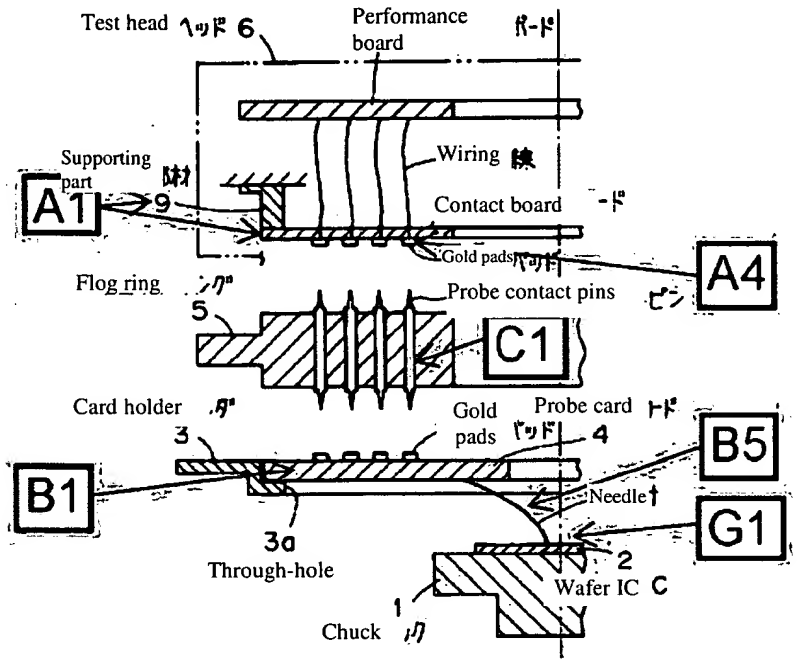
(Figure 1)



(Figure 2)



(Figure 3)



B6: terminals on B2

A5: orientation adjust means

A6: differential screws

(DETAILED DESCRIPTION OF THE UTILITY MODEL)

(0001)

(FIELD OF INDUSTRIAL APPLICATION)

This utility model relates to a test head for IC test equipment, and a mechanism for connecting to a specimen; specifically, to one that does not require pushing force to make a connection.

(0002)

(PRIOR ART)

The test head and sample in prior wafer IC (wafer onto which several layers of semiconductor circuits have been laminated) test equipment, i.e. the connection mechanism to the wafer IC (below referred to simply as the "connection mechanism"), will be described with reference to Figure 2 and Figure 3.

Wafer IC 2 is attached on top of chuck 1. A round concavity 3a for housing the probe card 4 is formed in the center of the square plate on the card holder 3, and the floor of the concavity 3a is cut out, with the exception of the fringe, forming a through-hole 3b.

(0003)

Probe card 4 is formed into a round plate shape, in the center of which is formed a rectangular or round hole 4a. Several needles 4b for forming an electrical connection with the prescribed portion of the wafer IC 2 are implanted around the hole 4a on the rear of the probe card 4. The needles 4b extend sideways and downwards on the side of the hole 4a, so that the tip of the needles protrude into the bottom of the hole 4a. Several gold pads 4c, each connected to a needle 4b, are arrayed in a ring within the fringe on top of the probe card 4.

(0004)

A block ring 5 is arranged onto the probe card 4 on the same axis in order to electrically connect each gold pad 4c of the probe card 4 to the test head 6. Probe contact pins 5a pierce through the ring-shaped circuit board of the flog ring 5 opposite each gold pad 4c on the probe card 4. Probe contact pins 5a are made in such a way that each end is pointed, and each end protrudes from the top and the bottom.

(0005)

A ring-shaped contact board 7 is arranged on the same axis in test head 6 across from the flog

ring 5. Gold pads 7a are formed across from each probe contact pin 5a of flog ring 5 on the floor of the contact board 7. Supporting part 9 holds contact board 7 in place in test head 6. Each gold pad 7a of the contact board is connected to performance board 8 in test head 6 by wiring 10.

(0006)

To test a wafer IC 2, the probe card 4 is attached to the card holder 3, and the card holder 3 and chuck 1 are positioned relative to one another in such a way that the needles 4b of the probe card 4 touch the portion of the wafer IC 2 that is to be tested, and the flog ring 5 and test head 6 are positioned so that the bottom end of probe contact pin 5a on flog ring 5 is brought in contact with the corresponding gold pad 4c on the probe card 4, and gold pad 7a on contact board 7 of test head 6 is brought in contact with the top end of its corresponding probe contact pin 5a on flog ring 5.

(0007)

Next, the test head 6 is moved downwards, pressing the flog ring 5. The pressure applied at this time is approximately 100g for each probe contact pin 5a; consequently, in the case of 1000 pins, the pressure applied is quite large at approximately 100kg. This large force is deemed necessary to form an electrical connection between the contact board 7 and the flog ring 5, and between the flog ring 5 and the probe guard 4. This force is received by the card holder 3, and is not applied to the wafer IC 2.

(0008)

(PROBLEM TO BE SOLVED BY THE UTILITY MODEL)

In prior connection mechanisms, large pressing force was applied to the probe card 4 from the test head 6 via the flog ring 5, which deformed the probe card 4, causing large discrepancies in the height of the tip of the needles 4b, in turn causing problems in terms of the reliability of the connection with the wafer IC 2.

(0009)

Several gold pads 4c are arranged in a ring on the probe card 4, and there are several patterns for forming an electrical connection between these gold pads 4c and their corresponding needles 4b, which was a problem in terms of the time required for designing and manufacturing.

Furthermore, as mentioned above, large force was applied to the card holder 3 supporting the probe card 4, for which reason the probe card had to be furnished with a card holder 3 and a mechanism to support the card holder 3, which was a problem in that this mechanism was complex and costly.

(0010)

The purpose of this utility model is to solve these problems by reducing the force that needs to be applied to the probe card 4 and the card holder 3 in order to form an electrical connection, thereby preventing deformation of the probe card 4 and improve connection reliability; to simplify the card holder 3 and its support mechanism, thereby reducing their expense; and to simplify the design and manufacture of patterns for connecting to the multiple needles 4b on the probe card 4.

(0011)

(MEANS OF SOLVING THE PROBLEM)

The connection mechanism of this utility model is equipped with the following probe card, card holder and connector panel. The probe card is furnished with multiple needles for forming an electrical connection with the specimen on the floor of the circuit board, on top of which are mounted a zero insertion/removal force connectors furnished with a contact that is electrically connected to each of these needles. A card holder supports this probe card. A connector panel is attached to the test head across from the probe card, and is furnished with zero insertion/removal force connectors that are connected to the aforesaid zero insertion/removal force connectors on the probe card.

(0012)

(EXAMPLES OF EMBODIMENT)

To avoid repetition in describing the embodiments of this utility model, the same symbols will be used to refer to corresponding portions in Figure 1, Figure 2 and Figure 3. In this example, probe card 4 is square, and, as in the prior art, needles 4b are implanted in the floor around hole 4a. In this example, zero insertion/removal force connectors 4d equipped with multiple pin contacts on the top of the probe card 4 are placed in three rows each on the left and right side of the hole 4a, running parallel to the hole 4a. Each of these pin connectors is connected to its corresponding needle 4b via the pattern.

(0013)

Test head 6 is furnished with a square connector panel 11 in place of the prior connector board

7. The zero insertion/removal force connectors 11a equipped with socket contact for connecting to the zero insertion/removal force connectors 4d on the probe card 4 are mounted in three rows to the right and to the left on said panel 11. Each socket contact of said connector 11a is connected to the performance board 8 via wiring 10.

(0014)

As the name implies, zero insertion/removal force connectors 4d and 11a require no application of force when they are being inserted or removed. Commercially available methods may be used, e.g. narrowing or widening the space between the pin contact and the socket contact by using a cylinder to drive a rail integrated lengthwise onto the connector in the forward/backwards direction, thereby moving a cam joined to the rail upwards/downwards, or any other method may be used.

(0015)

(EFFECT OF THE UTILITY MODEL)

In this utility model, the electrical connection between the test head 6 and the probe card 4 is formed by connecting the zero insertion/removal force connectors mounted respectively on each, thus eliminating the need to apply large pressing force to the probe card 4 in order to form a connection, which makes it possible to prevent deformation of the probe card 4 by pressing force, and improves the reliability of the connection between the needles 4b and the wafer IC 2.

(0016)

Furthermore, because this pressing force is also no longer applied to the card holder 3, the card holder 3 and its support mechanism can be simplified, which reduces production costs.

In the probe card 4, the zero insertion/removal force connectors can be arranged across the hole 4a on both sides, hence roughly parallel to the needles 4b, thus simplifying the design and manufacture of the pattern used to connect the terminal pins on the connector to the needles 4b.